DDF Annual Report

Title of Investigation

Reduced Surface Wave Antenna Elements that Improve Performance for Large Aperture Passive Microwave Radiometry

Principal Investigator:

R. B. Gosselin

Other In-house Members of Team:

None

Other External Collaborators:

None

Initiation Year:

2004

Aggregate Amount of Funding Authorized in FY 2003 and Earlier Years:

None

FY 2004 Authorized Funding:

$16K

Actual or Expected Expenditure of FY 2004 Funding:

In-house: $12K spent on research effort and completion of first milestone.

Status of Investigation at End of FY 2004:

Terminated in FY 2004

Investigation was conducted up to completion of first milestone; which was a research effort to investigate the technical challenges on a systems-level and improve the understanding of the detrimental effects of surfaces waves for passive microwave radiometry instrument applications.

The investigation was not completed beyond that first milestone since the PI's job description and interests significantly changed to that of management. Funding of this effort did not begin until May of 2004, and by that time the PI was assigned to duties that greatly reduced the level of manpower effort which was available from the PI. The result of the efforts were very successful for the brief period between May and September of 2004 but the previously anticipated computer modeling and actual design of hardware was not possible because of time constaints.

Expected Completion Date:

Investigation is complete.

Purpose of Investigation

Improve antenna performance for 2-D STAR microwave instrument applications. Minimization of surface waves surrounding the antenna elements has never been applied to determine the level of improvement this would provide for microwave radiometric applications. The research from this DDF was intended to lead to a demonstration of the detrimental effects of those surface waves, and to offer some proof of the advantages for implementation of a new type of antenna element where the surface waves are minimized. The impact of antenna performance on system-level performance was also going to be demonstrated.

FY 2004 Accomplishments:

Applications Made of Investigation's Results During FY 2004

Patents: None

Reports, Journal Articles, Other Publications: None

Papers for Presentation at Professional Society Meetings, Seminars, Symposia, and

Other Important Forums: None

Awards Received: None

Planned Future Work: None

Summary:

(1) Project's innovative features: This DDF proposed an approach which was very innovative since it offered a potential improvement in system-level performance of 2-D STAR microwave radiometer. The level of this improvement in performance (by increasing the sensitivity) is anticipated to be tremendous and the other improvement was it would greatly reduce the complexity of the computations since a G-Matrix approach would no longer be necessary.

(2) Potential payoff to Goddard/NASA: The ultimate payoff for NASA was took a very basic engineering approach to solving some of the problems that have plagued 2D STAR radiometry (such as the Code 975 2D ESTAR mission which was never successful at producing an image).

(3) The criteria for success: The criteria for success for this DDF was going to be measurable in terms of mutual coupling measurements between adjacent antenna elements, and demonstration that it is greatly reduced compared with traditional antenna elements. The ultimate criteria for success (beyond the scope of the DDF) is to incorporate this new element into the design of a 2D STAR Radiometer.

(4) Technical risk factors that might have, or that in fact have, prevented achieving success:

There were no technical risk factors which prevented the success of this DDF.

The results of the research resulting from the DDF have been shared with others who have demonstrated their technical interest in this new area. A DDF with a similar approach was submitted for FY05 by Manuel A Quijada and the results of the research effort from this DDF were provided to inspire his work; which took a different approach to minimize the surface waves. His work shows tremendous promise and is encouraged although it was not funded for FY05.